

Localization and Dynamics of Filamentous Actin in Nuclei Isolated from *Spisula* Oocytes

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Actin was first discovered in oocyte nuclei in 1979. Its functional significance, however, has remained obscure. Recently, actin has been shown to play an essential role in chromosome congression in activated starfish oocytes. Particularly, fluorescently labeled actin introduced into the living oocyte was shown to be transiently associated with chromosomes during congression after nuclear envelope breakdown. Questions remain about the mechanism of the formation of this network that moves chromosomes toward the animal pole. In this study, we used high-resolution imaging to address localization and dynamics of actin in isolated surf clam nuclei prior to oocyte activation. Phalloidin staining of non-fixed nuclei displayed propensity of f-actin to the nuclear cortex, which is consistent with previous findings. In many nuclei actin was seen to be evenly diffused throughout the nucleoplasm. Unexpectedly, f-actin was also strongly co-localized with the meiotic chromosomes. These groups of actin appeared to be stable and resistant to treatment with cofilin and gelsolin, but were depolymerized by treatments with high calcium/EDTA. To address the dynamics of nuclear actin, we pulse-labeled the nuclei with fluorescently labeled monomeric actin. Exogenous actin was seen to quickly incorporate throughout the nucleoplasm and nuclear rim areas. However, to incorporate fluorescently labeled actin in the chromatin-associated structures overnight incubation was required. Together, our results show that nuclear actin forms a stable, weakly dynamic association with meiotic chromosomes in quiescent clam oocytes. Furthermore, they may suggest a role for f-actin in chromosome structure or positioning prior to dynamic association on congressing chromosomes observed after nuclear envelope breakdown.